

CLAIMS

1. A process for the polymerization of at least one aliphatic C<sub>2-20</sub> or aromatic C<sub>4-20</sub> hydrocarbyl mono- or multiolefin in the presence of a catalyst and a boron comprising co-catalyst, characterized in that the catalyst comprises a composition of a metal-organic reagent, a spectator ligand (SH) and optionally at least one equivalent of a hydrocarbylating agent.
5. A process according to claim 1, wherein the metal-organic reagent is represented by ML<sub>j</sub>X<sub>p</sub>, wherein M is a metal from group 3-11, or the lanthanide series, X a monoanionic ligand bonded to M, L a neutral ligand bonded to M, j representing an integer denoting the number of neutral ligands L and p is the valence of the metal M.
10. A process according to claim 1 or 2, wherein the hydrocarbylating agent comprises a metal or a metalloid chosen from group 1, 2, 11, 12, 13 or 14.
15. 4. A process according to claim 3, wherein the hydrocarbylating agent comprises Li, Mg, Zn, or Al.
5. Process according to claim 4, wherein the hydrocarbylating agent .is a C<sub>1-C<sub>20</sub></sub> trihydrocarbyl aluminium or aluminoxane.
6. Process according to claim 1-5, carried out in the presence of a base other than the hydrocarbylating agent.
20. 7. A process according to claim 1-6, wherein the spectator ligand is an imine ligand, or the HA adduct thereof, wherein HA represents an acid, of which H represents its proton and A its conjugate base.
8. A process according to claim 2-7, wherein the metal-organic reagent comprises a group 4 metal and a cyclopentadienyl comprising ligand.
25. 9. A process according to claim 1-5, wherein the spectator ligand is represented by (HA<sub>1</sub>)<sub>q</sub>-Z<sub>n</sub>-(A<sub>2</sub>H)<sub>r</sub>, wherein A<sub>1</sub> and A<sub>2</sub> are monoacidic cyclopentadienyl comprising ligands, with q and r representing an integer denoting the number of Cp ligands with q+r = 1 or 2, optionally linked by n parallel bridging groups Z, A<sub>1</sub>, A<sub>2</sub> separately, or bonded via Z together forming a bidentate diacidic spectator ligand.
30. 10. A process according to claim 1-5, wherein the ligand is a ligand according to the formula HA<sub>1</sub>-Z-D(H)<sub>b</sub>, in which A<sub>1</sub> is a delocalized  $\eta^5$  bonding cyclopentadienyl comprising ligand, Z is a moiety comprising boron, or a member of Group 14, and optionally also sulfur or oxygen, said moiety having up to 20 non-hydrogen atoms, and optionally A<sub>1</sub> and Z together form a fused

ring system, D is a Lewis basic ligand bonded to Z and M, comprising a group 15 or 16 atom and having up to 20 non-hydrogen atoms, optionally D and Z together form a fused ring system and b= 0 or 1.

11. A process according to claim 9 or 10, wherein the metal is a group 4 or group 5 metal, or a metal selected from the lanthanide series.
- 5 12. A process according to claim 1-6, wherein the ligand, represented by  $(Ar-R-s)Y(-R-DR'n)_q$ , with, Y representing an anionic moiety of S bonded to M of the metal-organic compound, R an optional bridging group between the Y moiety and the DR', and/or Ar group, D a hetero atom chosen from group 15 or 16, R' an optional substituent, Ar an electron-donating aryl group, n the number of R' groups bonded to D, q and s integers with  $q + s \geq 1$ .
- 10 13. A process according to claim 12, wherein the metal is a group 4 metal with a valency of 3.
14. A process according to claim 1-5, wherein the ligand is represented by  
15  $R-D-(Z-D)_n-R$   
wherein Z is a bridging group, between two donor atom containing groups (D), D a group comprising a hetero atom chosen from group 15 or 16, and R is a substituent.
- 15 16. A process according to claim 14, wherein the metal is a metal from Group 7 –  
20 11.
17. Polymer obtainable with the process of claims 1-15.
18. Polymer obtainable with the process of claim 12, wherein Y is an imine group.
- 25 19. Polymer obtainable with the process of claim 17, wherein the imine is a ketimide, phosphinimide, guanidine, or iminoimidazoline.
19. Polymer obtainable with the process of claim 12 wherein D is a ketimide, phosphinimide, guanidine, or an iminoimidazoline.